(19) World Intellectual Property Organization

International Bureau



(43) International Publication Date 11 August 2005 (11.08.2005)

PCT

(10) International Publication Number WO 2005/074045 A1

(51) International Patent Classification⁷:

H01L 33/00

(21) International Application Number:

PCT/JP2005/001642

(22) International Filing Date: 28 January 2005 (28.01.2005)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2004-021479 29 January 2004 (29.01.2004) JP 60/541,069 3 February 2004 (03.02.2004) US

(71) Applicant (for all designated States except US): SHOWA DENKO K.K. [JP/JP]; 13-9, Shibadaimon 1-chome, Minato-ku, Tokyo, 1058518 (JP).

(72) Inventors; and

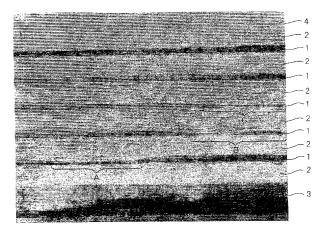
(75) Inventors/Applicants (for US only): MIKI, Hisayuki [JP/JP]; c/o SHOWA DENKO K.K., 5-1, Yawata Kaigan dori, Ichihara-shi, Chiba, 2900067 (JP). SAKURAI, Tetsuo [JP/JP]; c/o SHOWA DENKO K.K., 5-1, Yawata

Kaigan dori, Ichihara-shi, Chiba, 2900067 (JP). **TAKEDA, Hitoshi** [JP/JP]; c/o SHOWA DENKO K.K., 5-1, Yawata Kaigan dori, Ichihara-shi, Chiba, 2900067 (JP).

- (74) Agents: AOKI, Atsushi et al.; A. AOKI, ISHIDA & AS-SOCIATES,, Toranomon 37 Mori Bldg., 5-1,, Toranomon 3-chome, Minato-ku, Tokyo, 1058423 (JP).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: GALLIUM NITRIDE-BASED COMPOUND SEMICONDUCTOR MULTILAYER STRUCTURE AND PRODUCTION METHOD THEREOF



(57) Abstract: An object of the present invention is to provide a gallium nitride compound semiconductor multilayer structure useful for producing a gallium nitride compound semiconductor light-emitting device which operates at low voltage while maintaining a satisfactory light emission output. The inventive gallium nitride compound semiconductor multilayer structure comprises a substrate, and an n-type layer, an active layer, and a p-type layer formed on the substrate, the active layer being sandwiched by the n-type layer and the p-type layer, and the active layer comprising a thick portion and a thin portion, wherein the active layer has a flat lower surface (on the substrate side) and an uneven upper surface so as to form the thick portion and the thin portion.

WO 2005/074045 A1



Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.